



Australian Government

AURTTM3009 Fit sleeves and bore and hone engine cylinders

Release 2

AURTTM3009 Fit sleeves and bore and hone engine cylinders

Modification History

Release	Comment
Release 2	Replaces AURTTM3009 Fit sleeves and bore and hone engine cylinders (Release 1) Reference to OHS legislation replaced with new WHS legislation

Unit Descriptor

Unit descriptor	<p>This unit describes the performance outcomes required to fit sleeves to restore engine cylinder blocks and to bore and hone the sleeves to specific tolerances. It involves assessing damage to engine cylinders and determining the required repair action. It requires the ability to fit sleeves as a method of cylinder repair and prepare and use boring and honing machines to machine engine cylinders to specifications and workplace requirements.</p> <p>No licensing, legislative, regulatory or certification requirements apply to this unit at time of endorsement.</p>
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Application of the Unit

Application of the unit	Work applies to sleeving, reboring and honing in an engine reconditioning process. Engine cylinders to be sleeved, bored and honed may include those of light vehicles, heavy vehicles, agricultural and plant equipment, recreational vehicles and motorcycles.
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Licensing/Regulatory Information

Refer to Unit Descriptor.

Pre-Requisites

Not applicable.

Employability Skills Information

Employability skills	This unit contains employability skills.
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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Prepare to bore cylinders	<p>1.1. Workplace instructions are used to determine job requirements, including method, process and equipment</p> <p>1.2. Information is accessed, procedures and methods are analysed, and appropriate tooling options are selected for fitting sleeves and boring and honing engine blocks</p> <p>1.3. Tools and measuring equipment are checked and prepared for operation</p> <p>1.4. Safe operating procedures and workplace health and safety (WHS) and environmental requirements are observed throughout the work</p> <p>1.5. Measuring and/or calibration for boring is performed</p> <p>1.6. Engine cylinder block is prepared for boring</p> <p>1.7. Reboring machine is prepared to accept cylinder block or barrel</p> <p>1.8. Cylinder block is positioned, securely clamped and limit stop is set</p>
2. Bore cylinders	<p>2.1. Boring operations are performed without causing damage to components or system</p> <p>2.2. Cylinders are checked/measured with instruments to ensure compliance with specifications</p> <p>2.3. Boring operations are completed to required specifications and honing allowances</p>
3. Prepare to sleeve cylinder block	<p>3.1. Tools and equipment for sleeving are selected, checked and prepared for operation</p> <p>3.2. Measuring and/or calibration requirements for sleeving are determined and required sleeve is selected</p> <p>3.3. Engine cylinder block is prepared for sleeving</p>
4. Sleeve engine cylinder blocks	<p>4.1. Sleeving operations are performed without causing damage to components or system</p> <p>4.2. Measuring operations are performed to ensure compliance with specifications</p> <p>4.3. Boring operations are completed to required specifications and honing allowances</p>
5. Prepare cylinders for honing operations	<p>5.1. Tools and equipment for honing are selected, checked and prepared for operation</p>

ELEMENT	PERFORMANCE CRITERIA
	<p>5.2.Measuring and/or calibration requirements for honing are determined</p> <p>5.3.Bored cylinder is cleaned of residue and swarf, using appropriate cleaning materials for the component</p> <p>5.4.Honing machine is prepared to accept cylinder block or barrel</p> <p>5.5.Cylinder is positioned and securely clamped, and required hone stroke is set</p> <p>5.6.Hone stones are selected and speed is set to achieve required finish and cross hatch</p>
6. Hone cylinders	<p>6.1.Cylinder is honed at correct speed and rate to required finish without causing damage to components or system</p> <p>6.2.Components are checked/measured with instruments to ensure compliance with specifications</p> <p>6.3.Honing operations are completed to specifications, ensuring required piston to bore clearance is achieved</p>
7. Finalise sleeving, boring and honing processes	<p>7.1.Cylinder is thoroughly cleaned of residue honing oil</p> <p>7.2.Final inspection is made to ensure finished work complies with workplace requirements</p> <p>7.3.Machined surfaces are treated with a protective coating to prevent rust if cylinder engine block is to be stored</p> <p>7.4.Engine cylinder block is prepared for storage according to workplace requirements</p> <p>7.5.Workplace documentation is processed according to workplace procedures</p>

Required Skills and Knowledge

This section describes the skills and knowledge required for this unit.

Required skills

- technical skills to:
 - select correct replacement tip or sharpen tool for material to be bored
 - identify worn and damaged cutting tools
 - mount and position cutting tools
 - set machining parameters to achieve job requirements and maximise tool life
 - use appropriate and sufficient clamping and mounting of the work piece
 - use coolant and lubricant correctly
 - check for conformance to specifications
 - measure to specified tolerances and dimensions
- communication skills to:
 - follow oral instructions
 - report deviations from specifications
 - interact with customers and team members
- literacy skills to:
 - read and interpret routine job instructions, specifications, drawings and standard operating procedures
 - identify and analyse technical information
 - understand quality procedures
- numeracy skills to use mathematical ideas and techniques to:
 - calculate time
 - assess tolerances
 - apply accurate measurements
 - calculate material requirements
 - establish quality checks
- problem-solving skills to:
 - locate, interpret and apply workplace policies and procedures, including manufacturer and component supplier procedures
 - identify and avoid planning and scheduling problems
 - prevent time and material wastage
 - organise work and plan processes
- self-management skills to:
 - select and use appropriate equipment, materials, processes and procedures
 - follow workplace documentation, such as codes of practice and operating procedures
- technology skills to use communication devices and computerised equipment to search and gather supporting material

Required knowledge

- WHS regulations and requirements, equipment, material and personal safety requirements, including:
 - personal protective equipment (PPE) for handling engine cylinder blocks, using boring and honing machines, and using chemical cleaning and lubricating agents
 - hazards associated with rotating boring and honing tools
- types and application of sleeves, including:
 - dry sleeves, including:
 - interference fit parallel sleeve
 - interference fit flanged sleeves
 - chrome-type finished-to-size dry flanged sleeves
 - wet sleeves, including:
 - flanged
 - stepped
- sleeve fitting procedures, including:
 - fitting interference sleeves, including fitting parallel sleeves to step in parent bore
 - fitting wet sleeves
- types, characteristics and limitations of honing and boring machines, including:
 - types and grades of boring tools
 - types and grades of honing stones
 - hand-held and machine-operated hones
- tool sharpening methods, including:
 - maintaining sharpness of tool throughout boring operations
 - compensation methods for tool wear throughout boring operations
- boring methods and procedures, including:
 - determining required size of bore, including honing allowance
 - preparing the engine cylinder block for boring and setting engine cylinder block into boring machine, including jigs, rails and clamps
 - setting the boring tool to the correct diameter, locking the boring tool and setting the limit stop
 - reasons for taking a test cut
 - speed and feed rates of the boring tool for differing materials, such as alloysil or nicolsil, and for bore diameters
 - methods for setting the speed and feed rate of the boring tool
- honing methods and procedures, including:
 - cleaning the engine cylinder block before and after honing
 - preparing portable and stationary honing machines, setting engine cylinder block into honing machine and setting hone stroke

- setting honing speeds and feed rates to achieve required finish
- methods of measuring bores for taper, ovality and barrelling
- types and application of cleaning, lubricating and protective agents, including:
 - material suitability
 - application of lubricating agents for different speeds and feed rates of boring machines and honing machines
 - hazards associated with chemical cleaning and lubricating agents
- Australian standards relating to engine reconditioning

Evidence Guide

Evidence Guide	
The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	<p>The evidence required to demonstrate competency in this unit must be relevant to workplace operations and satisfy all of the requirements of the performance criteria and required skills and knowledge.</p> <p>A person who demonstrates competency in this unit must be able to:</p> <ul style="list-style-type: none"> • observe safety procedures and requirements • select boring and honing methods and techniques appropriate to the circumstances • complete preparatory activity in a systematic manner • fit a range of sleeves to engines according to workplace, manufacturer and component supplier requirements • bore and hone a range of multi-cylinder engines according to workplace, manufacturer and component supplier requirements • complete work without damage to tools and equipment, or injury to persons.
Context of, and specific resources for assessment	<p>Competency is to be assessed in the workplace or a simulated workplace environment that accurately reflects performance in a real workplace setting. Performance is demonstrated consistently over a period of time and in a suitable range of contexts.</p> <p>Assessment is to occur:</p> <ul style="list-style-type: none"> • using standard workplace practices and procedures • following safety requirements • applying environmental constraints. <p>Assessment is to comply with relevant:</p> <ul style="list-style-type: none"> • regulatory requirements • Australian standards • industry codes of practice. <p>The following resources must be made available for the assessment of this unit:</p>

Evidence Guide

	<ul style="list-style-type: none"> • appropriate worksite • multi-cylinder engine blocks appropriate to the workplace, including in-line multi-cylinder engine blocks and vee-configuration multi-cylinder engine blocks • fixed and portable hand, air and power tools and equipment appropriate to reboring and honing cylinders and barrels • specifications and work instructions.
Method of assessment	<p>Assessment must satisfy the endorsed Assessment Guidelines of this Training Package.</p> <p>Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of required skills and knowledge.</p> <p>Assessment methods must be by direct observation of tasks and include questioning on required skills and knowledge to ensure its correct interpretation and application.</p> <p>Assessment must confirm that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances.</p> <p>Competence in this unit may be assessed in conjunction with other units which together form part of a holistic work role.</p> <p>Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.</p> <p>Assessment processes and techniques must be culturally sensitive and appropriate to the language and literacy capacity of the candidate and the work being performed.</p>

Range Statement

Range Statement	
<p>The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.</p>	
<i>Workplace instructions</i> may include:	<ul style="list-style-type: none"> • computer-generated instructions • verbal instructions • written instructions.
<i>Information</i> may include:	<ul style="list-style-type: none"> • Australian standards • engineer's design specifications and instructions • instructions issued by authorised workplace or external persons • workplace specifications and requirements • regulatory and legislative requirements relating to the automotive industry, including Australian Design Rules • safe work procedures relating to the operation of machinery associated with fitting sleeves to engine cylinder blocks and boring and honing engine cylinders • verbal, written and graphical instructions, signage, work schedules, plans, specifications, work bulletins, memos, material safety data sheets (MSDS), diagrams or sketches.
<i>Tools and measuring equipment</i> may include:	<ul style="list-style-type: none"> • arbors • clamps • dial bore gauges • dial indicators • inside and outside micrometers • press • pullers.
<i>WHS requirements</i> may include:	<ul style="list-style-type: none"> • individual state or territory regulatory requirements • operational risk assessment and treatments associated with: <ul style="list-style-type: none"> • electrical safety • machinery movement and operation • manual and mechanical lifting and shifting • toxic substances

Range Statement	
	<ul style="list-style-type: none"> • working in proximity to others and site visitors • PPE required by legislation, regulations, codes of practice and workplace policies and procedures.
<i>Environmental requirements</i> are to include:	<ul style="list-style-type: none"> • clean-up management • dust and noise minimisation • waste management.
<i>Measuring and/or calibrating</i> may include:	<ul style="list-style-type: none"> • determining piston to bore clearance • determining sizes of cut • determining required honing allowance.
<i>Preparing for boring</i> may include:	<ul style="list-style-type: none"> • removing main bearings from engine block • fitting a torque plate to engine block.
<i>Preparing reboring machine</i> must include:	<ul style="list-style-type: none"> • clamps • jigs • rails.

Unit Sector(s)

Competency field	Mechanical Miscellaneous
Sector	Technical - Manufacture

Custom Content Section

Not applicable.